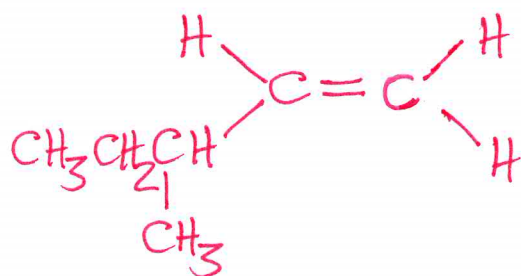
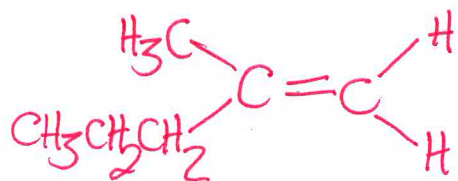
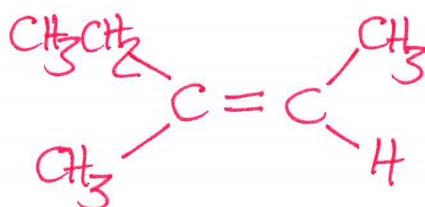
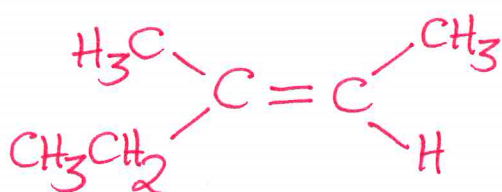
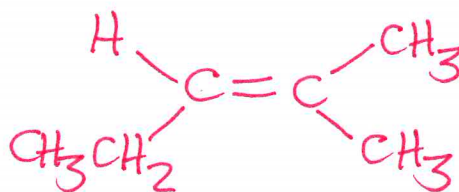
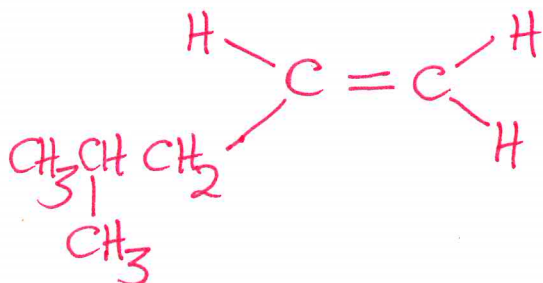


(g) Draw and name all the alkene isomers of  $C_6H_{12}$  with five (5) carbon atoms in the longest carbon chain. any 5

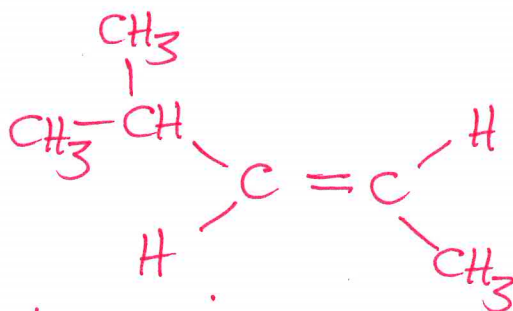
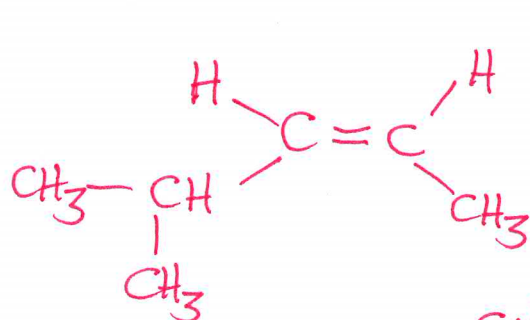
10



Name these isomers yourselves.



cis-trans isomers

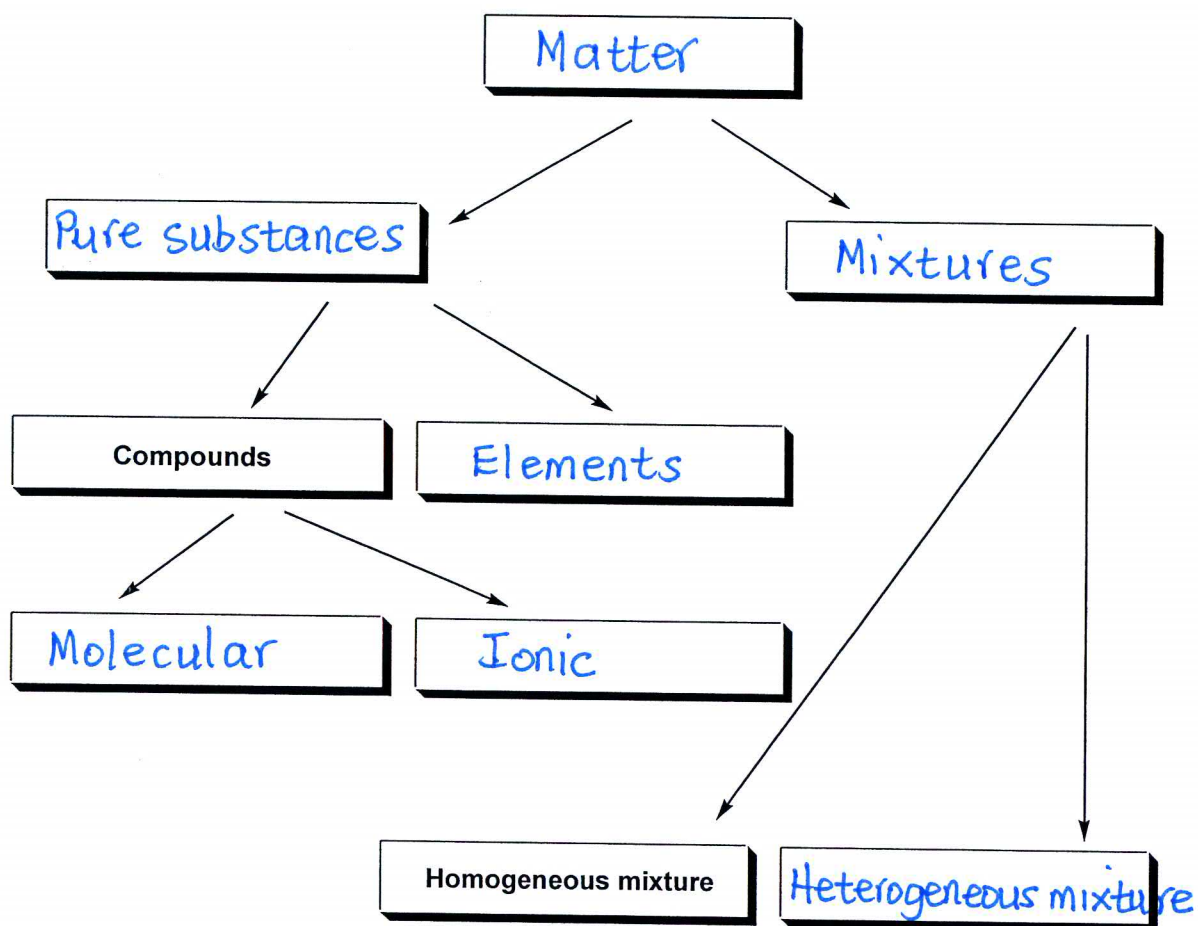


cis-trans isomers

**Question 3**

(7)

(a) Complete the following chart:



(7)

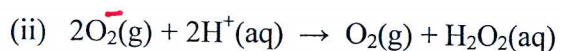
(b) What is an enzyme?

A protein that catalyzes (speeds up) biochemical processes

Name the enzymes associated with each of the following reactions that occur in red blood cells:



Enzyme: catalase



Enzyme: superoxide dismutase

In the chemical equations above, what does **aq** stand for? aqueous

Suggest two reasons why  $\text{O}_2^-$  is much more reactive than  $\text{O}_2$ :

It is a free radical

It has a small bond order ( $1\frac{1}{2}$ ); thus can break more easily.

(c) What is wrong with the following (**explain** without correcting the mistake)

(4)

AuCL gold chloride

The symbol of the chloride ion is written wrongly.  
The oxidation state of the gold atom is not indicated.

Give the electron configuration of the  $\text{Au}^+$

$\text{Au} : 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^1 4f^{14} 5d^{10}$

$\therefore \text{Au}^+ : 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 4f^{14} 5d^{10}$

(d) Name the element in Period 5 that has the largest number of unpaired electrons?

(2)

molybdenum

Which rule or principle supports your answer?

Hund's rule

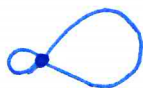
(1)

(e) A group of orbitals of the same kind that have the same energy are called a

subshell of atomic orbitals

(2)

(f) Sketch below an  $sp^2$  hybrid orbital



(2)

(g) The Schrödinger equation from which wave functions of atomic orbitals are derived is studied in quantum mechanics.

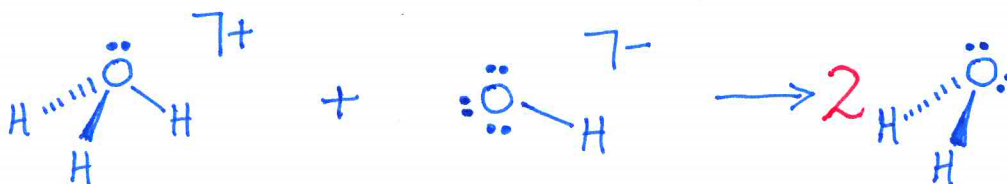
(2)

(h) Give a mathematical statement of the Heisenberg uncertainty principle:

$$\Delta x \cdot \Delta(mv) \geq h/4\pi$$

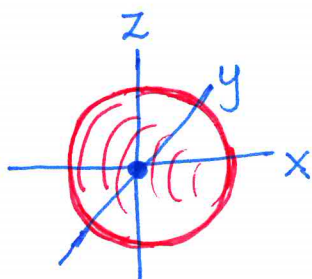
(i) Write a **balanced** chemical equation **using molecular shapes** to show that the **hydronium ion** reacts with the **hydroxide ion** to produce **water**.

(5)





- (2) (j) Give **two** VSEPR formulae for an angular molecular geometry.  
 $AB_2E$  and  $AB_2E_2$
- (2) (k) The N-H bond has a larger dipole moment than the N-O bond  
 because of larger electronegativity difference between its atoms.
- (3) (l) How does a **3p orbital** differ from a **5p orbital**?  
 A 3p orbital is smaller than a 5p orbital  
 A 3p orbital has lower energy than a 5p orbital  
 A 3p orbital has one radial node whereas a 5p orbital has three radial nodes.
- (2) (m) Give **two** different **hybridizations** of a central atom that give a **linear molecular shape**.  
sp and  $dsp^3$
- (2) (n) In an atom, the lowest and highest energy levels for electrons are  $n=1$   
 and  $n=\infty$ , respectively.
- (2) (o) The general electron configuration of the valence electrons of Group 14 elements is  
 $ns^2np^2$
- (2) (p) If there are many possible Lewis structures of a given molecule or polyatomic ion  
 the best Lewis structure is the one that has the smallest formal charges
- (2) (q) When two electrons are placed in the same orbital they must have opposite spins  
 according to the Pauli exclusion principle.
- (3) (r) The molecular shapes that can be obtained from an octahedral orbital shape are  
octahedral, square pyramidal, square planar
- (2) (s) Give a specific **symbol for the wave function** of a  **$4p_z$**  atomic orbital:  $\psi_{4,1,0}$
- (5) (t) Sketch a **3s atomic orbital** and describe it.



A 3s orbital is spherical and is in the third shell. It has two radial nodes ( $n-l-1$ ).